Remarks and Arguments

This response follows a telephone interview between the examiner and the undersigned, during which the substance of the most recent office action was discussed. In that office action, the examiner rejected claims 1 and 8 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,229,142 ("Bateman"). In making that rejection, the examiner stated that Bateman included all of the features of the claimed invention, including an ion pulser that accelerates the ions of an initial ion beam in a perpendicular direction so as to form a band-shaped ion beam, and gridless slit diaphragms that focus the beam in a direction perpendicular to the direction of the original ion beam and to the direction of pulser acceleration. However, after a careful examination of the Bateman reference, it appears that there is no such focusing subsequent to the acceleration of the beam by the pulser.

Bateman discloses a time-of-flight (TOF) mass spectrometer that uses an "ion pusher 21" and an "ion mirror 26" to redirect an initial ion beam in a direction perpendicular to the original ion axis, and then reflect it back toward a detector. The ions become separated based on their original velocity allowing discrimination between ions with different mass-charge ratios. However, there is no mention of focusing of the ion beam in a direction perpendicular to the plane of the beam.

The present invention is similar to Bateman in that it has an initial ion beam that travels in a first direction (the "x-direction"). The beam is accelerated in a second, perpendicular direction (the "y-direction") by an ion pulser to form a band-shaped beam, which is ultimately reflected toward a detector. However, in addition, a focusing element is used to focus the beam in a third direction (the "z-direction") which is perpendicular to the x-direction and the y-direction Nowhere in Bateman is there any suggestion of focusing the ion beam formed by the ion pusher in a direction perpendicular to both the original beam direction and the direction of acceleration provided by the ion pusher. The original beam of Bateman travels through a hexapole rod assembly which, in effect, provides focusing in all radial directions perpendicular to the direction of the ion beam. However, this is prior to the ion beam reaching the ion

pusher, when the beam is still substantially linear in form. In the present invention, focusing is provided in the z-direction *after* the ions are accelerated by the pusher to form a band-shaped beam. This z-direction focusing is done using gridless slit diaphragms, and reduces dispersion of the beam in the z-direction. As recited in applicant's Claim 1, "the gridless slit diaphragms of the pulser and the reflector provide focusing of the ion bem on the detector in a direction parallel to an axis z that is perpendicular to both the x-axis and the y-axis." There is no such feature suggested anywhere in the Bateman reference. Claim 8 depends from Claim 1 and is therefore equally unsuggested by the cited prior art. Reconsideration of Claims 1 and 8 under this ground for rejection is respectfully requested.

Claims 2 and 3 were rejected under 35 U.S.C. §103(a) as being obvious over Bateman in view of U.S. Patent No. 5,160,840 ("Vestal"). In this rejection, the Bateman reference was apparently cited for the same reasons as discussed with regard to Claim 1. Vestal is added as showing a TOF spectrometer with "a two-stage reflector, a short deceleration field, a reflection field and at least one cylindrical lens to contribute to the focusing of the ion beam." However, Vestal is not concerned with the formation of a band-shaped ion beam, dealing only with linear ion beams or ion pulses. Thus, there is no suggestion of focusing in a direction perpendicular to the plane of such a beam, and the combination of Bateman and Vestal appears to still fall short of suggesting applicant's claimed invention. Each of Claims 2 and 3 depends from Claim 1, and each therefore inherits all of that parent claim's limitations, including the use of gridless slit diaphragms to focus a band-shaped ion beam in a direction perpendicular to both the x-direction and the y-direction (*i.e.*, the original ion beam direction and the direction of acceleration by the ion pulser). Reconsideration of Claims 2 and 3 under this ground for rejection is respectfully requested.

Claim 7 was rejected under 35 U.S.C. §103(a) as being obvious over Bateman in view of U.S. Patent No. 5,614,711 ("Li"). Again, Bateman appears to have been cited for the same reasons as provided with the rejection to Claim 1, while Li is cited as showing a particular arrangement of slit diaphragm electrodes and a repeller electrode.

However, the combination of Bateman and Li still appears to fall short of suggesting the present invention. Li discloses a TOF mass spectrometer that operates with a substantially linear ion trajectory, and therefore is unrelated to the band-shaped beam configurations of the present invention. As such, there is nothing in the combination of Bateman and Li that is suggestive of the present invention as recited in Claim 7. That is, there is simply no suggestion of focusing a band-shaped beam in a z-direction, as it is defined in applicant's claims. Reconsideration of Claim 7 under this ground for rejection is respectfully requested.

Claim 9 was rejected under 35 U.S.C. §103(a) as being obvious over Bateman in view of U.S. Patent No. 5,734,161 ("Koster"). Once again, Bateman is apparently cited for the same reasons as provided in the rejection to Claim 1. Koster is cited in combination as disclosing "a spectrometer comprising an electrical capacitor that generates a capacitor field parallel to the x-axis and that deflects the band-shaped ion beam in a direction parallel to the y-axis after it leaves the pulser." Koster does, in fact, disclose a TOF mass spectrometry method in which an ion beam 12 is created and passes through a gridless aperture 11 to encounter a collision gas cloud 19 prior to passing into the flight tube of the spectrometer. However, the Koster patent, including the section referenced by the examiner, does not appear to mention a "band-shaped ion beam." Rather, the excerpt cited by the examiner discusses energy filtering of the ion beam. Indeed, the ion beam of Koster clearly is not redirected by an ion pulser, and therefore lacks any band shape. As such, the combination of Bateman and Koster lacks any suggestion of focusing a band-shaped beam in a z-direction perpendicular to the plane of the beam. Since Claim 9 depends ultimately from Claim 1, this claim is therefore unsuggested by the cited prior art combination for the reasons provided above with regard to Claim 1. Reconsideration of Claim 9 under this ground for rejection is respectfully requested.

The allowability of Claims 5 and 6 is acknowledged. However, these claims have not been rewritten at this time, as it is believed that the claims from which they depend are also properly allowable for the reasons provided above.

In light of the foregoing remarks, it is respectfully requested that all the claims be allowed such that the application may be passed to issue. If it is believed that a telephone conference will help expedite prosecution of the application, the examiner is invited to call the undersigned. The Commissioner is hereby authorized to charge any fees due for the filing of this paper to applicant's attorneys' Deposit Account No. 02-3038.

Respectfully submitted

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